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PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR
EV Lac IN 1980

A program of photoelectric observations of flare stars has been started at the National Astronomical Observatory of the Bulgarian Academy of Sciences using a 60 cm Cassegrain reflector with a photoelectric equipment. In this paper we report the observations of the flare star EV Lac during the summer of 1980.

The photoelectric equipment consists of a one channel photometer (described by A. Tomov, Dissertation, 1977, Sofia) and a photoncounting system. The photomultiplier used is the EMI 9789 QB. The transformation of our instrumental ubv system to the international UBV system is given by the equations:

$$\Delta V = \Delta v - 0.12 \cdot \Delta(b-v)$$

$$\Delta(B-V) = 1.14 \cdot \Delta(b-v)$$

$$\Delta(U-B) = 1.08 \cdot \Delta(u-b)$$

The monitoring intervals in U.T. as well as the total monitoring time for each night are given in Table I. The observations have been carried out in "u" colour with an integration time of 1 sec. Generally, one registration has been made every 3 sec, but when a flare was noticed, an-every-1sec-registration has been switched over. In this way for every flare a time-resolution of 1 sec was achieved.

During the total of 21^h32^m monitoring time 11 flares were observed, the characteristics of which are given in Table II. For each flare following characteristics are given:

- a. The date and universal time of flare-maximum.
- b. The duration before and after maximum (t_b and t_a respectively).
- c. The total duration of the flare.

d. The intensity ratio I_f/I_o , where I_f is the flare maximum intensity less sky background and I_o is the quiet state intensity less sky background.

e. The increase of the star magnitude at flare maximum:

$$\Delta m(u) = 2.5 \log(I_f/I_o)$$

where "u" is the ultraviolet magnitude of the star in our instrumental system.

f. The standard deviation of random noise fluctuations in mag.

$$\sigma(\text{mag}) = 2.5 \log \frac{I_o + \sigma}{I_o}$$

The light curves of the observed flares in colour "u" are shown in Figs. 1-11. We want to make brief comments about some interesting features of individual flares.

Flare N^o 3 shows a distinct pre-flare intensity minimum with a duration of about 40 sec and with a superposed pre-flare. The "anti-flare" lies some 0.07 mag below the mean intensity level.

About 2 min after the maximum of flare N^o 3, an increased value (up to 20%) of "σ" for random-noise is observed. This could probably mean that some of the small "noise-peaks" contain flare activity. This is probably the case for flare N^o 5, too, again 2-3 min after the flare maximum.

Flares N^o 4 and N^o 5 form a "double-flare" with two peaks of similar shape and amplitude at 3.5 min apart from each other. The reason for considering them different flares is that before flare N^o 5 intensity reached almost quiet state level.

Flare N_o 7 shows that the maximum light with $\Delta m_f = 0.75$ mag is reached within 7 sec.

For flare N^o 11, 6-point averages have been plotted, because of the long duration of the flare. With the total duration of 20 min this is the most powerful flare in this report.

We want to thank Ing. A. Ustabashiev for his valuable technical assistance.

Table I

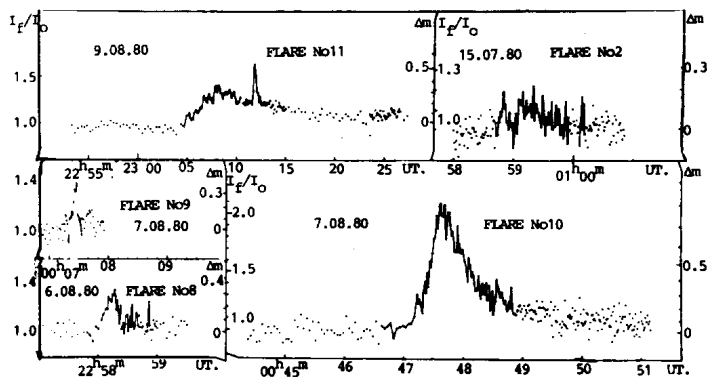
Date	Monitoring intervals (U.T.)	Total Effective Monitoring Time
July		
14/15	23 ^h 39 ^m 25 ^s -23 ^h 46 ^m 20 ^s , 234635-235018, 235039-235616, 235630-000120, 000136-000713, 000730-001520, 001533-002447, 002507-003323, 003340-004227, 004243-004908, 004926-005745, 005800-010708, 010726-011643, 011658-012426, 011241-013244, 013300-013650.	1 ^h 53 ^m 21 ^s
15/16	232753-233254, 233308-234716, 234734-000407, 000421-002825, 002843-004449, 004505-010150, 010206-011851, 011909-013125.	2 01 28
16/17	225149-230107, 230252-231212, 231246-231740, 231816-232744, 232751-235328, 235357-001544, 001658-003843, 003857-005959, 010015-011347, 011358-013009.	2 32 57
17/18	225405-230043, 230107-230842, 230857-231347, 231405-232300, 232317-233145, 233158-234237, 234254-235309, 235321-000850, 000905-002121, 002135-002351.	1 27 21
August		
2	222312-223448, 223548-223651.	0 12 39
4/5	224711-225930, 225945-231643, 231652-233102, 233122-235140, 235200-235240, 235252-002630, 002641-004241, 004322-010918, 010933-012017, 012131-015048, 015104-020015.	3 09 11
5/6	230111-232857, 232913-002200, 002317-005439, 005502-012549, 012610-020036.	2 57 28
6/7	222826-224611, 224631-224711, 224725-230338, 230355-232440, 232509-233746, 233759-234418, 234439-234518, 234533-000637, 000652-002556, 002612-005414, 005523-011750, 011807-013410, 013434-014012.	3 07 16
7	223421-224305, 224320-231321.	0 48 45
8/9	222616-223104, 223121-223541, 223551-224347, 224401-225303, 225314-230402, 230416-231027, 231038-231834, 231849-232721,	

Table I (continued)

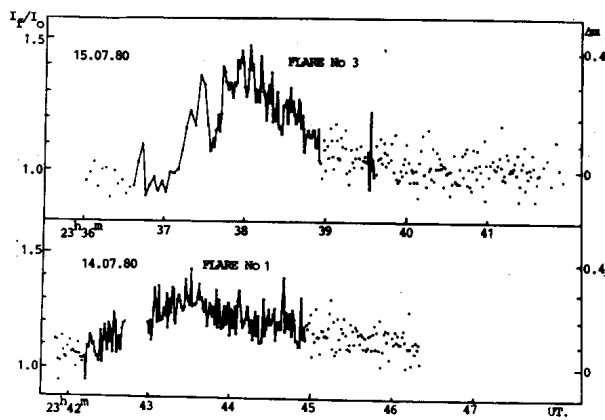
8/9	232832-233636, 233648-234401, 234411-000356, 000407-001522, 001535-002428, 002441-003420, 003439-004033, 004042-010131, 010145-010855, 010907-011623, 011639-014853, 014912-015308.	<u>3 21 42</u>
	Total	21 ^h 32 ^m 08 ^s

Table II
 Characteristics of the Flares Observed

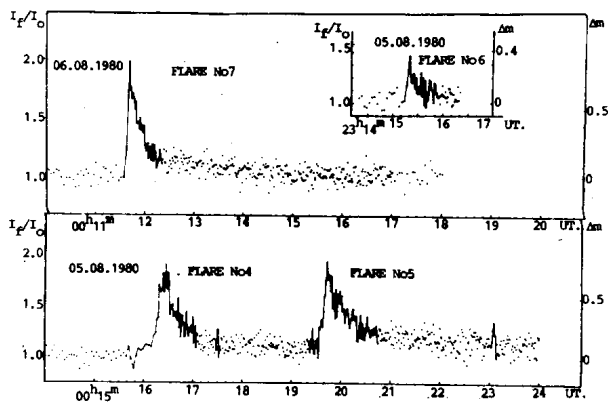
Flare Date	U.T.	t_b	t_a	Duration	I_f/I_o	Δm	σ
No. 1980	max	min	min	min		mag	mag
1	14.07 23 ^h 43 ^m 31 ^s	1.3	2.8	4.1	1.42	0.38	0.06
2	15.07 00 59 20	1.3	1.5	2.8	1.22	0.22	0.05
3	15.07 23 38 03	1.7	3.5	5.2	1.48	0.42	0.06
4	5.08 00 16 27	0.6	1.9	3.5	1.90	0.69	0.07
5	5.08 00 19 43	0.4	4.4	4.8	1.93	0.71	0.075
6	5.08 23 15 20	0.2	1.2	1.4	1.38	0.35	0.06
7	6.08 00 11 42	0.1	4.1	4.2	1.99	0.75	0.06
8	6.08 22 58 16	0.4	1.5	1.9	1.36	0.34	0.07
9	7.08 00 07 27	0.1	0.7	0.8	1.40	0.37	0.07
10	7.09 00 47 38	0.8	5.3	6.1	2.10	0.81	0.07
11	9.08 23 11 50	4	16	20	1.62	0.53	0.09



Figures 2, 8, 9, 10, 11



Figures 1, 3



Figures 4, 5, 6, 7

K.P.PANOV

M.K.TSVETKOV

Department of Astronomy with
 National Astronomical Observatory
 Bulgarian Academy of Sciences
 Sofia-1000,7-th November Str.1
 Bulgaria